(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
23 August 2001 (23.08.2001)

PCT

(10) International Publication Number
WO 01/60226 A1

(51) International Patent Classification[7]: A47L 9/16, B01D 45/12

(21) International Application Number: PCT/KR00/00222

(22) International Filing Date: 16 March 2000 (16.03.2000)

(25) Filing Language: Korean

(26) Publication Language: English

(30) Priority Data:

2000/08037	19 February 2000 (19.02.2000)	KR
2000/10629	3 March 2000 (03.03.2000)	KR
2000/10630	3 March 2000 (03.03.2000)	KR

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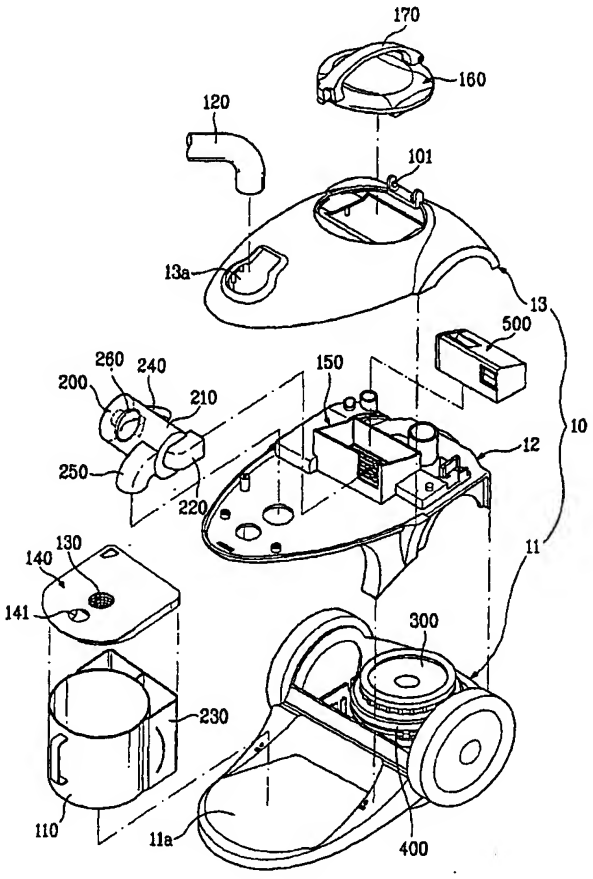
(81) Designated States *(national)*: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent

[Continued on next page]

(54) Title: MULTI CYCLONE VACUUM CLEANER



(57) Abstract: The disclosure is directed to a cyclone dust collector for separating air from dusts by way of a centrifugal force and, more particularly, to a novel canister type vacuum cleaner capable of using a dual cyclone dust collector with maximized allowable dust capacity. The entire structure of the vacuum cleaner as suggested herein is configured for the user's simple manipulation in discarding various foreign matters collected in the vacuum cleaner, thereby improving reliability to the user.

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(AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report*

— *with a declaration as to non-prejudicial disclosures or exceptions to lack of novelty*

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MULTIPLE CYCLONE VACUUM CLEANER

Technical Field

The present invention relates generally to a cyclone dust collector making use of the principle of cyclone and, more particularly, to a vacuum cleaner provided with the cyclone dust collector.

Background Art

Among the cyclone dust collectors, a duel type cyclone dust collector comprising a primary cyclone dust collector 1 and a secondary cyclone dust collector is configured to perform iterative dust collection of foreign matters more effectively than a single cyclone dust collector.

Figs. 1 to 3 illustrate an application of the above-stated dual type cyclone dust collector to an upright type vacuum cleaner.

That is, the vacuum cleaner provided with the dual type cyclone dust cleaner includes first and secondary cyclone dust collectors 1 and 2 provided in a cleaner body, a fan 3 provided at the bottom in the cleaner body for generating the suction force, and a fan motor 4 for driving the fan 3.

In taking the dual type cyclone dust collector into operation, the fan motor 4 is driven to rotate the fan 3 and therefore generate the suction force.

Thus a variety of foreign matters as well as air in the room are sucked into the dual type cyclone dust collector and introduced into an exterior body 1a via the primary cyclone dust collector 1 and a first air inlet passage 1b.

The air and fine dusts introduced into the exterior body 1a pass through a first air outlet passage 1c and a second air inlet passage 2b in sequence due to a successive suction force and enter an interior body 2a.

Meantime, relatively large dusts cannot enter through holes formed on the circumferential surface of the first air outlet passage 1c and gather at the bottom in the exterior body 1a due to their weight.

The air and the fine dusts introduced into the interior body 2a are subjected to the centrifugal force during the entrance to the interior body 2a.

This results from the second air inlet passage 2b extending in a tangential direction with respect to the circumference of the interior body 2a.

Thus the air and the fine dusts rotating along the inside of the interior body 2a are separated from each other due to a difference in the centrifugal force.

Relatively heavy-weighted fine dusts fall down along the inside wall of the interior body 2a due to their weight and gather in a dust collecting section 2d and the air gets out to the outside via a second air outlet passage 2c through an ascending air current formed at the center of the inside of the interior body 2a.

Here, a partition plate 2e is provided to separate the dust collecting section 2d from the bottom in the exterior body 1a lest a variety of foreign matters collected in the space should be communicated between the two divided spaces.

The secondary cyclone dust collector 2 of the above-stated dual cyclone dust collector has to be configured to collect fine dusts.

Nevertheless, entrance of relative light-weighted fine dusts through the second air outlet passage to a space where the fan 3 and the fan motor 4 exist is not

avoidable.

This is because the secondary cyclone dust collector 2 is configured to collect foreign matters using the cyclone effect in the same manner as the primary cyclone dust collector 1.

Thus the fine dusts inseparable from the air due to the cyclone effect, along with the air, enter the space where the fan motor 4 exists.

Especially, considering that the primary cyclone dust collector 1 is configured to collect relatively large dusts solely, while the fine dusts continue to enter the secondary cyclone dust collector 2 of which the allowable dust capacity is too low. It is thus required for the user to discard the foreign matters collected in the secondary cyclone dust collector 2 in order to prevent damages on the fan motor 4.

To solve the above problem, the primary cyclone dust collector 1 has to be provided with a large-sized exterior body, which is the reason why the dual type cyclone dust collector has been applied only to upright type vacuum cleaners.

That is, the above-structured dual cyclone dust collector has such a low allowable dust capacitor as not to be applied to a canister type vacuum cleaner and provides much inconvenience to the users.

Disclosure of Invention

It is, therefore, an object of the present invention to provide a canister type vacuum cleaner newly configured to use a dual type cyclone dust collector provided with a primary cyclone dust collector having a maximized allowable dust capacitor.

It is another object of the present invention to provide a structure of the

vacuum cleaner configured for the user's easy manipulation in discarding foreign matters collected in the dust collector, thereby enhancing reliability in regard to the user's manipulation.

It is further another object of the present invention to provide a vacuum cleaner configured not only to iteratively remove fine dusts not collected at the secondary cyclone dust collector and entering the space where the fan motor exists, but also to perform iterative cleaning of the fine dust collecting region.

To achieve the above objects of the present invention, there is provided a multiple cyclone vacuum cleaner including: a cleaner body having a space for mounting a fan and a fan motor, and an externally exposed space for selectively mounting a primary cyclone body and dust tank; a first air inlet passage provided in communication with the dust tank, for intake of air and various foreign matters; a first air outlet passage provided at the top of the dust tank, for exhausting the air firstly removed of the foreign matters; a secondary cyclone body provided on the dust tank, for circulation of air in a direction perpendicular to the axial direction of the dust tank; a second air inlet passage provided in communication with the first air outlet passage and the secondary cyclone body, for introducing the air and the foreign matters exhausted from the first air outlet passage to the secondary cyclone body; a second air outlet passage piercing the lateral side of the secondary cyclone body in the vicinity of the second air inlet passage; and a foreign matter outlet passage provided in communication with the secondary cyclone body and a second dust tank, for introducing the foreign matters separated from the air in the secondary cyclone body to the second dust tank.

In another aspect of the present invention, in a vacuum cleaner having a cyclone dust collector removably provided in a cleaner body, wherein the cyclone dust collector sucks air containing foreign matters, separates the feign matters from the sucked air by way of a cyclone principle, collects the foreign matters in a dust tank and exhausts the air to a space for mounting a fan via an air outlet passage, the multiple cyclone vacuum cleaner includes a filter structure removably provided in the cleaner body and having a separate dust collecting space between the air outlet passage of the cyclone dust collector and the fan mounting space, the filter structure being provided with a dust filter for a second dust collection of fine dusts contained in the air.

Brief Description of Drawings

The present invention will become more fully understood from the detailed description given hereinbelow and the accompanying drawings which are given by way of illustration only, and thus are not limitative of the present invention, and wherein:

Fig. 1 shows an external appearance of a general upright type multiple cyclone vacuum cleaner;

Fig. 2 is a schematic cross-sectional view showing the principal part of a cyclone dust collector shown in Fig. 1;

Fig. 3 is a perspective view of an exterior body of the cyclone dust collector shown in Fig. 2;

Fig. 4 is a schematic perspective view showing an external appearance of a

multiple cyclone vacuum cleaner according to an embodiment of the present invention;

Fig. 5 is a schematic exploded perspective view of a multiple cyclone vacuum cleaner according to the embodiment of the present invention;

Fig. 6 is a schematic vertical cross-sectional view showing a structure of the respective cyclone dust collectors shown in Fig. 5;

Fig. 7 is a schematic exploded perspective view of a multiple cyclone vacuum cleaner according to another embodiment of the present invention;

Fig. 8 is an exploded perspective view showing a filter structure shown in Fig. 7;

Fig. 9 is a vertical cross-sectional view taken along the line I-I of Fig. 8;

Fig. 10 is a schematic vertical cross-sectional view showing the internal structure of the multiple cyclone vacuum cleaner according to further another embodiment of the present invention;

Fig. 11 is an exploded perspective view showing the principal part of a stopper according to the present invention;

Figs. 12a and 12b are enlarged cross-sectional views showing the principal part of the stopper shown in Fig. 11, in which the stopper is associated with and detached from the cleaner body;

Fig. 13 is an exploded perspective view showing a situation that the stopper shown in Fig. 11 is applied to a general vacuum cleaner;

Fig. 14 is a detailed exploded perspective view showing the double structure of a handle according to the present invention;

Fig. 15 is a detailed cross-sectional view showing the principal part of the handle shown in Fig. 14, in which the handle is hinged to the cleaner body; and

Fig. 16 is an exploded perspective view showing a situation that the handle shown in Fig. 14 is applied to a general vacuum cleaner.

Best Mode for Carrying Out the Invention

A detailed description will be made below as to the preferred embodiments of the present invention with reference to Figs. 4 to 16.

Fig. 4 is a schematic perspective view showing an external appearance of a multiple cyclone vacuum cleaner according to an embodiment of the present invention, Fig. 5 is a schematic exploded perspective view showing an internal structure of the cyclone vacuum cleaner shown in Fig. 4, and Fig. 6 is a schematic vertical cross-sectional view of the cyclone vacuum cleaner shown in Fig. 5.

That is, an embodiment of the present invention is an application of a dual cyclone dust collector comprising first and secondary cyclone dust collectors 100 and 200 in a cleaner body 10 of a canister type vacuum cleaner, in which the primary cyclone dust collector 100 has a dust tank 110 with maximized allowable dust capacity. The dust tank 110 can be easily removed from the cleaner body 10 of the vacuum cleaner in order for the user to easily discard a variety of foreign matters collected in the dust tank 110.

For this, in an embodiment of the present invention, the cleaner body of the canister type vacuum cleaner is configured to be suitable for application of the dual type cyclone dust collector. That is, the cleaner body 10 includes a lower body 11, an

intermediate body 12 provided on the lower body 11, and a top cover 13 for covering the intermediate body 12.

The lower body 11 has a space for mounting a fan 300 and a fan motor 400, on the anterior side of which there is formed a portion 11a for installation of a primary cyclone body and dust tank 110.

The top cover 13 has a space where a secondary cyclone body 210 is located on the intermediate body 120, the space being closed to the outside of the cleaner body 10.

The primary cyclone dust collector 100 includes the primary cyclone body and dust tank 110, a first air inlet passage 120 in communication with the dust tank 110 for intake of air and various foreign matters, and a first air outlet passage 130 for discharging air removed of the foreign matters from the dust tank 110.

The first air inlet passage 120 is connected to a suction hose 40 and pierces through to the dust tank 110 via a through hole 13a formed on the anterior side of the top body 13.

The dust tank 110 has the top portion open, the top portion being optionally closed with a separate dust tank cover 140.

The dust tank cover 140 is centrally integrated with the first air outlet passage 130 and provided with a pipe hole 141 to the first air inlet passage 120.

The first air outlet passage 130 has the form of a perforated pipe in the circumference of which there are formed a plurality of through holes 131.

This is to prevent discharge of foreign matters relatively large in volume with respect to the size of the through holes 131 among the various foreign matters

introduced in the dust tank 110.

The secondary cyclone dust collector 200 includes the secondary cyclone body 210 located on the dust tank 110 of the primary cyclone dust collector 100, a second air inlet passage 250 in communication with the secondary cyclone body 210 for intake of air and fine dusts, a second air outlet passage 220 for discharging air removed of the fine dusts from the secondary cyclone body 210, and a foreign matter outlet passage 240 for discharging the fine dusts into a second dust tank 230.

The secondary cyclone body 210 is installed to provide air stream in the direction perpendicular to the lengthwise direction of the first dust tank 110.

The second air inlet passage 250 has the one end in communication with the first air outlet passage 130 and the other end extending in the circumference of the one end of the secondary cyclone body 210. And, the second air outlet passage 220 has the one end piercing through the lateral center of the secondary cyclone body 210 in the vicinity of the connection between the secondary cyclone body 210 and the second air inlet passage 250 and extending to the inside of the secondary cyclone body 210. The second air outlet passage 220 has the other end in communication with the space for mounting the fan 300 and the fan motor 400.

The foreign matter outlet passage 240 has the one end in communication with the circumference of the other end of the secondary cyclone body 210 on the opposite side to the second air inlet passage 250, and the other end in communication with the second dust tank 230.

The second dust tank 230 may be provided separately and, preferably, is integrated with the circumference of the dust tank 110 constituting the primary

cyclone dust collector 100 in order for the user to discard the dusts along with the dust tank 110 at once.

In connection with this, the present invention provides an integrated structure with the dust tank 110 of the primary cyclone dust collector 100 integrated with the second dust tank 230 of the secondary cyclone dust collector 200.

Also, an extension member 260 protrudes at a site where exhaust air current occurs in the secondary cyclone body 210 with a view to inducing more vigorous circulation of the exhaust air current in the secondary cyclone body 210.

The extension member 260 is centrally positioned on the inside surface of the secondary cyclone body 210 opposite to the side of the second air outlet passage 220. The extension member 260 has the form of a skirt widening gradually towards the side of the second air outlet passage 220.

The extension member 260 also separates an inlet port of the foreign matter outlet passage 240 from the site where the exhaust air current occurs, and thereby prevents the exhaust air current from entraining the various foreign matters discharged from the foreign matter outlet passage 240.

In a case where the multiple cyclone dust collector is applied in the cleaner body 10 of the canister type vacuum cleaner, a first embodiment of the present invention as constructed above maximizes the size of a dust collecting space of the primary cyclone dust collector 100, i.e., an allowable dust collecting space in the dust tank 110 even though the size of the cleaner body 10 exceeds the normal size.

Next, a description will be made in detail as to an operation of the multiple cyclone vacuum cleaner according to the first embodiment of the present invention

as constructed above.

First, a driving force from the fan motor 400 rotates the fan 300 to cause a suction force. Indoor air and various foreign matters are sucked into a suction opening body 20 constituting the vacuum cleaner and introduced into the first air inlet passage 120 of the primary cyclone dust collector 100 via an extension pipe 30 and the suction hose 40 in sequence.

Thus the various foreign matters are successively introduced into the primary cyclone body and dust tank 110. Foreign matters relatively large with respect to the diameter of the through holes 131 of the first air outlet passage 130 and air are collected in the dust tank 110.

Foreign matters relative small with respect to the diameter of the through holes 131 of the first air outlet passage 130 and air sequentially pass through the first air outlet passage 130 and the second air inlet passage 250 and enter the secondary cyclone body 210.

Here, the fine foreign matters are separated from the air due to cyclone effect during the entrance to the secondary cyclone body 210.

This results from the second air inlet passage 250 extending in the direction tangential to the circumference of the secondary cyclone body 210. That is, the suction force from the second air outlet passage 220 affects in a direction perpendicular to the air entrance direction of the second air inlet passage 250 so that air and fine dusts introduced into the secondary cyclone body 210 make cyclone motion and are separated from each other.

Thereafter, the fine dusts removed from the air circulate around the inner wall

of the secondary cyclone body 210 and enter the second dust tank 230 via the foreign matter outlet passage 240. The air separated from the fine dusts circulates through the secondary cyclone body 210 and collides with the extension member 260, during which the air is exhausted to the space for the fan 300 and the fan motor 400 via the second air outlet passage 220.

While on the other, Figs. 7 to 10 illustrate a multiple cyclone vacuum cleaner according to a second embodiment of the present invention.

That is, in the second embodiment of the present invention, a filter 500 with a separate dust collecting space is further provided between the second air outlet passage 220 constituting the secondary cyclone dust collector 200 and the space for the fan 300 and a dust filter 510 is provided on the dust collecting space of the filter structure 500, so as to collect the fine dusts in the air.

The filter structure 500 is detachable from the cleaner body 10 with a view to perform easy cleaning.

For this purpose, a receipt portion 150 with an inner space for receiving the filter structure is further provided on the top anterior side of the intermediate body 12 of the cleaner body 10. The receipt portion 150 is positioned on the topside of the mounting space of the fan 300. The receipt portion 150 is in communication with the space.

The above structure is to completely eliminate various fine foreign matters not removed by the cyclone effect with a separate filter. That is, the structure is configured to completely remove tissues or hairs of almost insensible weight that may contained in the air passed through the secondary cyclone dust collector 200 and

exhausted from the mounting space of the fan motor 400, so as to prevent a possible damage on the fan motor 400.

The dust filter 510 received in the filter structure 500 has an iterative profile of a plurality of protrusions and hollows in order to eliminate dusts as much as possible in spite of the small size of the dust filter 510. That is, the contact area of the dust filter with the air passing thereby is maximized to enhance the performance of the dust filter for dust collection.

Such a filter structure 500 includes a filter body 520 having an inner empty space and a filter guide 530 optionally provided in the filter body.

The filter body 520 has an appropriately rectangular parallelpiped profile with the bottom and the one side open, and has the other closed side provided with a through hole 521 connected to the second air outlet passage 220. The filter guide 530, if inserted in the filter body 520, has the one side closing the open portion of the filter body 520, and the inner bottom receiving the dust filter 510 and closing the open bottom side of the filter body 520.

The profile of the filter body 520 is not specifically limited to the rectangular parallelpiped and may be polyhedral or cylindrical in consideration of the profile characteristic according to the mounting position of the filter structure 500.

Also, the filter body 520 and the filter guide 530 are configured to have a mutual drawer-like association for convenience in removable installation. For this purpose, guide protrusions 522 are formed on a contact side of the inner surface of the filter body 520 with the both sides of the outer surface of the filter guide 530, and guide grooves 531 corresponding to the guide protrusions 522 are formed on the both

sides of the filter guide 530.

Further, a handle groove 523 is formed at the edge of the contact topside of the filter body 520 to be in contact with the filter guide 530.

The handle groove 523 serves as a holding portion to facilitate removal of the filter guide 530 from the filter body 520.

In sum, as the cleaner operates, dusts are separated from the air passing through the primary and secondary cyclone dust collectors 100 and 200 and the air removed of the dusts passes through the filter structure 500 in the course of escaping from the second air outlet passage 220 to the mounting space of the fan 300 and the fan motor 400. Fine dusts contained in the flowing air are removed through the dust filter 510 in the filter structure 500. That is, the fine dusts flowing through the second air outlet passage 220 enters the inner space of the filter structure 500 via the through holes 521 of the filter structure 500. Then, the air and the fine dusts continue passing through the dust filter 510 provided at the bottom of the filter structure 500.

Thus the fine dusts contained in the air are removed from the air again through the dust filter 510 and remain in the filter structure 500, while the clean air removed of the fine dusts pass through the dust filter 510 to the mounting space of the fan 300 and the fan motor 400.

The residual fine dusts separated from the air are collected at the inner space of the filter structure 500, so that the foreign matters cannot enter the mounting space of the fan motor 500 even when the fine dusts are exhausted in an excess of the allowable dust capacity of the second dust tank 230.

That is, although the user forgets to discard the foreign matters from the

second dust tank 230 and the fine dusts are exhausted in an amount exceeding the allowable dust capacity of the secondary cyclone dust collector 200 during the later cleaning, the fine dusts are collected again at a fine dust collecting space formed by the filter structure 500 so as to prevent a damage on the fan motor 400 caused by the fine dusts.

While on the other, the filter structure 500 as constructed above must be configured to be completely removable from the cleaner body 10 by the user who desires to clean the filter structure 500.

In connection with this, the present invention proposes that the mounting space of the receipt portion 150 in the cleaner body 10 should be open to the topside of the cleaner body 10.

A cover portion 160 is provided on the top cover 13 over the receipt portion 150 for the purpose of selectively opening/closing the mounting space of the receipt portion 150. The cover portion 160 has a handle portion 170 for convenience of manipulation. The handle portion 170 extends from the anterior side to the posterior of the cover portion 160. The handle portion 170 has the posterior side hinged on the cleaner body 10 with a hinge 101 and the anterior side selectively removable from the cleaner body 10 by means of a stopper means.

The structure is contrived for the handle portion 170 to service as both a handle for opening/closing the cover portion 160 for purpose of selective removal of the filter structure 500 and a handle for carrying the cleaner body 10.

This solves a problem of requiring an additional process for manufacturing a separate handle structure and the structural complexity for the handle structure.

To discard the fine dusts collected in the filter structure 500, the user detaches the handle portion 170 from the cleaner body 10 and turns the cover portion 160 integrated with the handle portion 170 to open the receipt portion 150 in which the filter structure 500 exists.

The user then removes the filter structure 500 from the receipt portion 150 by use of the handle groove 523 formed on the top of the filter structure 500 and discards the fine dusts collected in the filter structure 500.

That is, after removal of the filter structure 500 from the receipt portion 150, the user disassembles the filter structure 500 into the filter body 520 and the filter guide 530 and exhausts the inner space in the filter body 520 of the fine foreign matters.

The filter structure 500 is easily disassembled because the filter body 520 is associated with the filter guide 530 in a drawer-like manner.

Also, a defined space is formed between the top of the filter guide 530 and the upper surface of the dust filter 510 as the former is higher than the latter, so that various foreign matters piling up on the dust filter 510 cannot leak out to the outside even when the filter guide 530 is removed from the filter body 520 of the filter structure 500.

Also, further complete collection of the fine dusts can be achieved through a separate filter provided in the filter structure 500 in addition to the dust filter 510. However, the additional of the separate filter is not limited herein, considering that installation of too many filters may require an excessive driving force of the fan motor and result in deterioration of suction force.

It can be understood that addition of a separate filter 540 as shown in Figs. 8 and 9 would enhance the efficiency of dust collection.

In a second embodiment of the present invention, a structure designed to further collect the fine dusts contained in the air passed through the secondary cyclone dust collector 200 is not specifically limited.

That is, the filter structure 500 with a separate dust collecting space according to the present invention can be provided on the air path between the primary cyclone dust collector 100 and the secondary cyclone dust collector 200, or on the air path to the mounting space of the fan motor 400 via a single cyclone dust collector in the vacuum cleaner with either one of the above cyclone dust collectors.

On the other hand, among the aforementioned components, the stopper means for associating the handle portion 170 with the cleaner body 10 can have a hook type structure as a usual case. However, such a hook type stopper means according to the related art is configured to impose a force in the same direction as the user turns the handle portion 170 in opening the cover portion 160 so that the stopper means is sometimes compulsorily released by an indoor structure during a cleaning work to open the cover portion 160 unintendedly.

This leads to a problem in terms of use safety in the related art.

To cope with this problem, the present invention is most preferably configured to open the cover portion 160 only when a force is imposed on the stopper means in a direction opposite to the turning direction of the handle portion 170 for opening the cover portion 160.

For this purpose, the stopper means of the present invention, as shown in Fig.

11 and Figs. 12a and 12b, includes a stopper 13b formed on the top cover 13 of the cleaner body 10 and having a defined portion protruding towards the receipt portion 150, a tension portion 17 provided at the anterior end portion of the top cover 13 and selectively making an elastic motion towards the inside of the dust collecting space, and a holding ring 172 extending downward from the tension portion 171 and selectively fastened by the stopper 13b.

The tension portion 171 is rotatably provided at the anterior end portion of the handle portion 170 and elastically moved by means of a spring 173.

The holding ring 172 is substantially "U"-character shaped and, for fast joining to the stopper 13b, has both sides inwardly slanted towards the lower end when viewed from the later side.

Thus the user who desires to open the receipt portion 150 has only to pull the handle portion 170 with the tension portion 171 pushed down and turn the cover portion 160.

That is, as the user pushes down the tension portion 171, the tension portion 171 is turned elastically and the holding ring 172 extending downward from the tension portion 171 is also turned backward, as illustrated in Fig. 12b.

Thus the holding ring 172 is released from the stopper 13b of the cleaner body 10. At the same time, the user turns the cover portion 160 towards the posterior side of the cleaner body 10 to completely open the receipt portion 150.

The structure of the stopper means as described above can be used for many applications. That is, the stopper structure is applicable to a general canister type vacuum cleaner as shown in Fig. 13 and all portions where the stopper means is

required, as well as the cyclone vacuum cleaner of the present invention.

The above-stated structure of the stopper means is advantageous in regard to stability in holding. That is, when the user pulls the handle portion 170 without pushing down the tension portion 171, the stopper 13b of the cleaner body 10 is further inserted into the holding ring 172 and held firm to the holding ring 172.

Furthermore, the handle portion 170 of the present invention also serving as a handle of the cleaner body has to be stably associated with the cleaner body 10.

Especially, in contrast to the anterior side of the handle portion 170 stably fixed to the cleaner body 10 by means of the stopper means, the posterior side of the handle portion 170, when associated with the cleaner body 10 through a usual hinged structure, may have the hinged portion easily unfastened due to distortion of the handle portion 170.

Such a distortion of the handle portion 170 occurs often when the user holds the handle portion 170 in carrying the cleaner body 10 with a force concentrated on the hinge 101.

To cope with this problem, the present invention suggests a double structure of the handle portion 170 in which an internal reinforced member 174 is further provided to the hinge 102 of the handle portion 170, as illustrated in Figs. 14 and 15.

The reinforced member 174 may be simply provided to a part of the hinged portion and, when applied to the handle portion 170 as shown in Fig. 14, preferably constructed to serve as a cover of the handle portion 170.

An association between the handle portion 170 and the reinforced member 174 is accomplished by either a joint means such as bolt 175 or an adhesive means.

Such a structure is to prevent undesirable release of the handle portion 170 from the cleaner body 10 in a manner that the internal reinforced member 174 corrects the distortion of the handle portion 170. Here, the internal reinforced member 174 is fixed at the home position on the handle portion 170 by means of the bolt 175 or the like.

The structure for supplementing the hinge 101 as described above can be used for many applications. That is, the structure is applicable to a general canister type vacuum cleaner as shown in Fig. 16 and all portions using a general hinge joint, as well as the cyclone vacuum cleaner of the present invention.

Consequently, the present invention not only enables application of the dual cyclone dust collector to a canister type vacuum cleaner but also removes foreign matters further completely, thereby presenting satisfaction for the user.

Industrial Applicability

As described above, the present invention remarkably increases the entire allowable dust capacity of the dual cyclone dust collector, as a result of which the size of the cyclone dust collector can be reduced with respect of the allowable dust capacity and the dual cyclone dust collector can be applied to the canister type vacuum cleaner.

In applying the present invention to the canister type vacuum cleaner, the dust tank is easily removable from the cleaner body so that the user can manipulate the dust tank when discarding the foreign matters from the dust tank.

Furthermore, the present invention further includes a filter structure having

a separate dust collecting space in the vacuum cleaner using the cyclone principle, thereby achieving a complete collection of fine foreign matters not collected by the cyclone dust collectors.

That is, a possible leak of the fine foreign matters to the fan motor can be minimized through a second dust collection at the filter structure having the separate dust collecting space, even though the dust tank of the respective cyclone dust collectors leaks the fine dusts to the space for mounting the fan and the fan motor without completion dust collection. Also, the filter structure is configured to be removable from the topside of the cleaner body so that the user can easily discard the collected foreign matters from the filter structure.

Furthermore, the present invention improves the stopper and hinge structures of the handle portion for opening the dust collector cover with a consequence of stable manipulation and prevention of unintended opening of the dust collector. Thus the present invention is very useful in the industrial aspects due to the above-mentioned advantages.

Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as recited in the accompanying claims.

WHAT IS CLAIMED IS:

1. A multiple cyclone vacuum cleaner comprising:

a cleaner body having a space for mounting a fan and a fan motor, and an externally exposed space for selectively mounting a primary cyclone body and dust tank;

a first air inlet passage provided in communication with the dust tank, for intake of air and various foreign matters;

a first air outlet passage provided at the top of the dust tank, for exhausting the air firstly removed of the foreign matters;

a secondary cyclone body provided on the dust tank, for circulation of air in a direction perpendicular to the axial direction of the dust tank;

a second air inlet passage provided in communication with the first air outlet passage and the secondary cyclone body, for introducing the air and the foreign matters exhausted from the first air outlet passage to the secondary cyclone body;

a second air outlet passage piercing the lateral side of the secondary cyclone body in the vicinity of the second air inlet passage; and

a foreign matter outlet passage provided in communication with the secondary cyclone body and a second dust tank, for introducing the foreign matters separated from the air in the secondary cyclone body to the second dust tank.

2. The multiple cyclone vacuum cleaner as claimed in claim 1, wherein the cleaner body comprises:

a lower body provided with the fan and the fan motor;

an intermediate body provided at the top of the lower body to form the space for mounting the fan and the fan motor and a space for mounting the dust tank on an anterior side thereof; and

a top cover having a defined space for mounting the secondary cyclone body on the intermediate body and closing the defined space from the outside.

3. The multiple cyclone vacuum cleaner as claimed in claim 2, further comprising a filter structure provided on an air path of air flowing from the second air outlet passage to the space for mounting the fan, the filter structure being in communication with the second air outlet passage and the fan mounting space and having a separate dust collecting space, the dust collecting space being internally provided with a dust filter.

4. The multiple cyclone vacuum cleaner as claimed in claim 3, further comprising a cover portion for selectively opening or closing an open portion of the top cover constituting the cleaner body, the filter structure being positioned at the open portion.

5. The multiple cyclone vacuum cleaner as claimed in claim 4, wherein the cover portion of the cleaner body has the one end thereof hinged on the cleaner body and an end portion of the topside thereof integrated with a stopper structure including a hook for selectively holding the cleaner body.

6. The multiple cyclone vacuum cleaner as claimed in claim 1, wherein the second dust tank is integrated with the circumference of the primary cyclone body and dust tank.

7. The multiple cyclone vacuum cleaner as claimed in claim 1, further comprising a skirt-shaped extension member provided on the opposite side to the side of the second air outlet passage in the secondary cyclone body, the extension member gradually widening towards the side of the second air outlet passage.

8. A multiple cyclone vacuum cleaner in a vacuum cleaner having a cyclone dust collector removably provided in a cleaner body, wherein the cyclone dust collector sucks air containing foreign matters, separates the feign matters from the sucked air by way of a cyclone principle, collects the foreign matters in a dust tank and exhausts the air to a space for mounting a fan via an air outlet passage,

the multiple cyclone vacuum cleaner comprising a filter structure removably provided in the cleaner body and having a separate dust collecting space between the air outlet passage of the cyclone dust collector and the fan mounting space, the filter structure being provided with a dust filter for a second dust collection of fine dusts contained in the air.

9. The multiple cyclone vacuum cleaner as claimed in claim 8, wherein the dust filter received in the filter structure has the form of a plurality of iterative prominence and hollows.

10. The multiple cyclone vacuum cleaner as claimed in claim 8, wherein the filter structure comprises:

a filter body having the form of a hollow rectangular parallelpiped or polyhedron with a space for mounting a fan motor and an open portion perpendicular to the fan motor mounting space; and

a filter guide having the one end thereof selectively opening or closing the open portion of the filter body, the filter guide receiving the dust filter for a second dust collection of the fine dusts exhausted to the fan motor mounting space via the open portion.

11. The multiple cyclone vacuum cleaner as claimed in claim 10, wherein the filter body of the filter structure comprises guide protrusions formed on a contact inside thereof being in contact with both outer sides of the filter guide, and guide grooves corresponding to the guide protrusions on both sides of the filter guide, the guide protrusions being associated with the guide grooves in a drawer-like manner.

12. The multiple cyclone vacuum cleaner as claimed in claim 10, the filter body of the filter structure has a handle portion by recessing a part of the edge on the topside of the filter body to be in contact with the one end of the filter guide.

13. The multiple cyclone vacuum cleaner as claimed in claim 8, further comprising an open portion provided on the side of the filter structure in the outside of the cleaner body, and a cover portion selectively closing the open portion.

14. The multiple cyclone vacuum cleaner as claimed in claim 13, wherein the cover portion of the cleaner body has the one end thereof hinged on the cleaner body and the topside thereof integrated with a handle portion including a stopper means for selectively holding the cleaner body.

15. The multiple cyclone vacuum cleaner as claimed in claim 14, wherein the stopper means is manipulated for a release operation in the direction opposite to a turning direction for opening the cover portion.

16. The multiple cyclone vacuum cleaner as claimed in claim 14, wherein the stopper means comprises:

a stopper formed on the cleaner body and having a defined portion protruding towards the dust collecting space;

a tension portion provided at an anterior end of the cover portion and elastically moving towards the inside of the dust collecting space; and

a holding ring formed at the bottom of the tension portion and selectively caught by the stopper.

17. The multiple cyclone vacuum cleaner as claimed in claim 16, wherein the holding ring is substantially "U"-character shaped and has both sides thereof inwardly slanted towards the lower end.

18. The multiple cyclone vacuum cleaner as claimed in claim 14, wherein the

handle portion has a double hinged structure with a separate reinforced member at a hinged portion thereof.

19. The multiple cyclone vacuum cleaner as claimed in claim 18, wherein an exterior body is integrated with an interior body by way of a fastening means or an adhesive means.

20. The multiple cyclone vacuum cleaner as claimed in claim 13, wherein the cover portion comprises a transparent material for observing the amount of dusts collected in the filter structure mounted in the cleaner body.

FIG.1
Prior Art

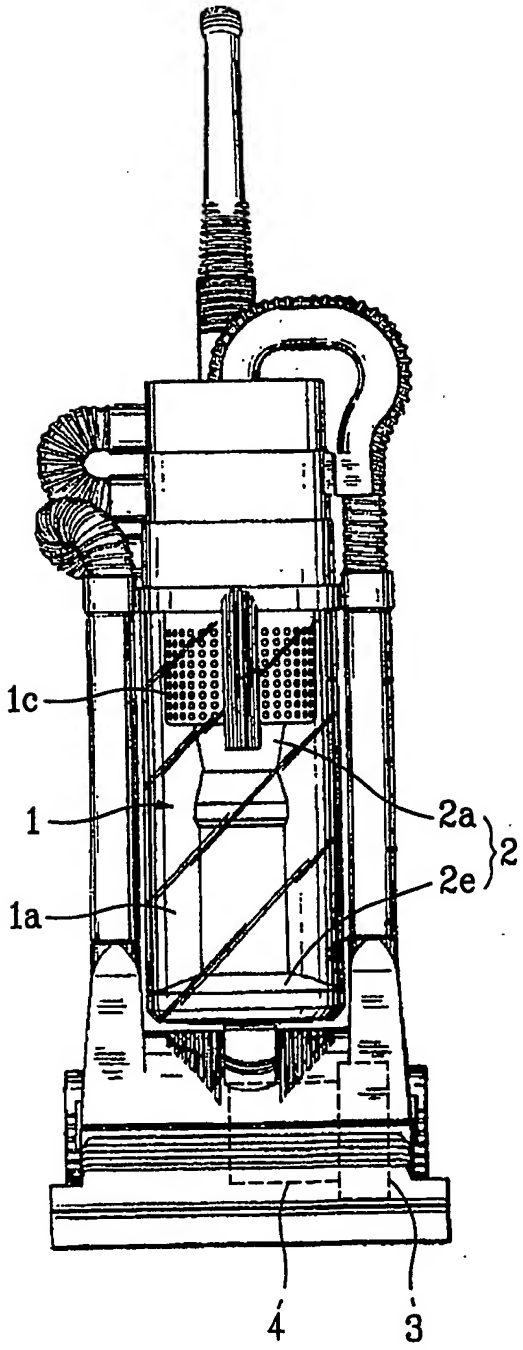

FIG.2
Prior Art

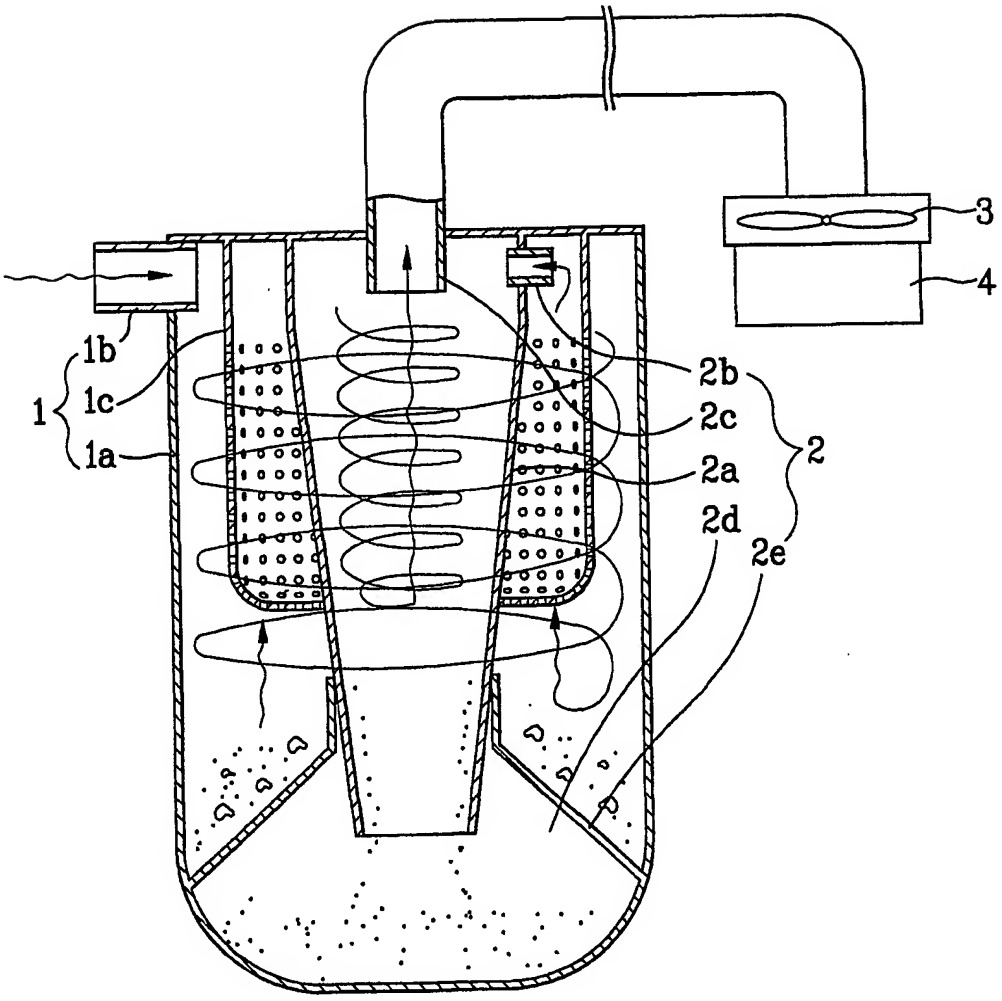

FIG.3
Prior Art

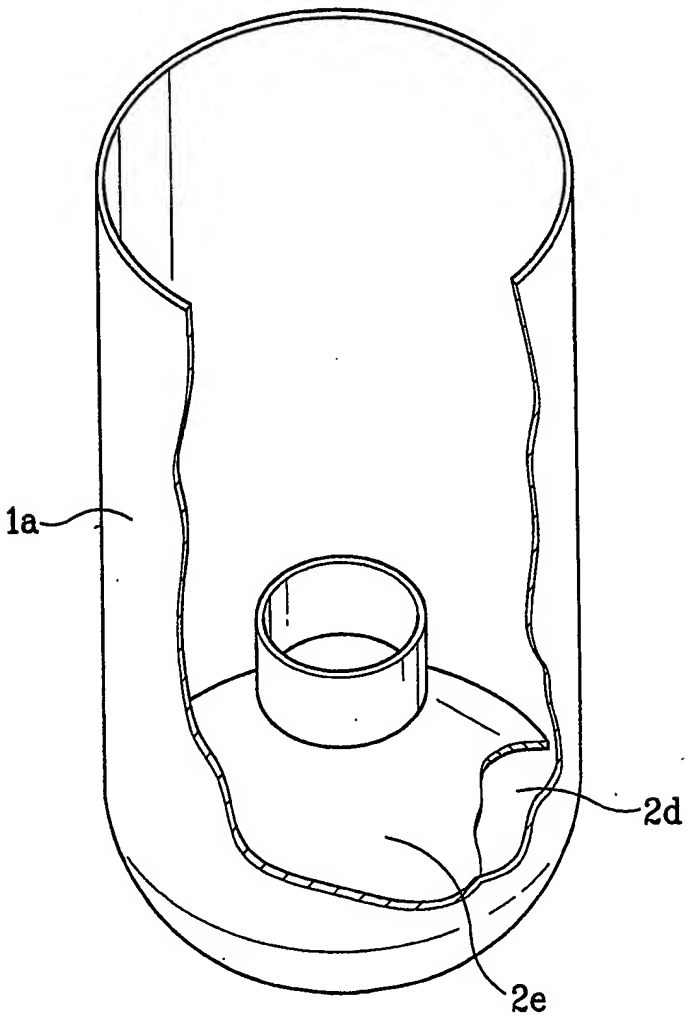

FIG. 4

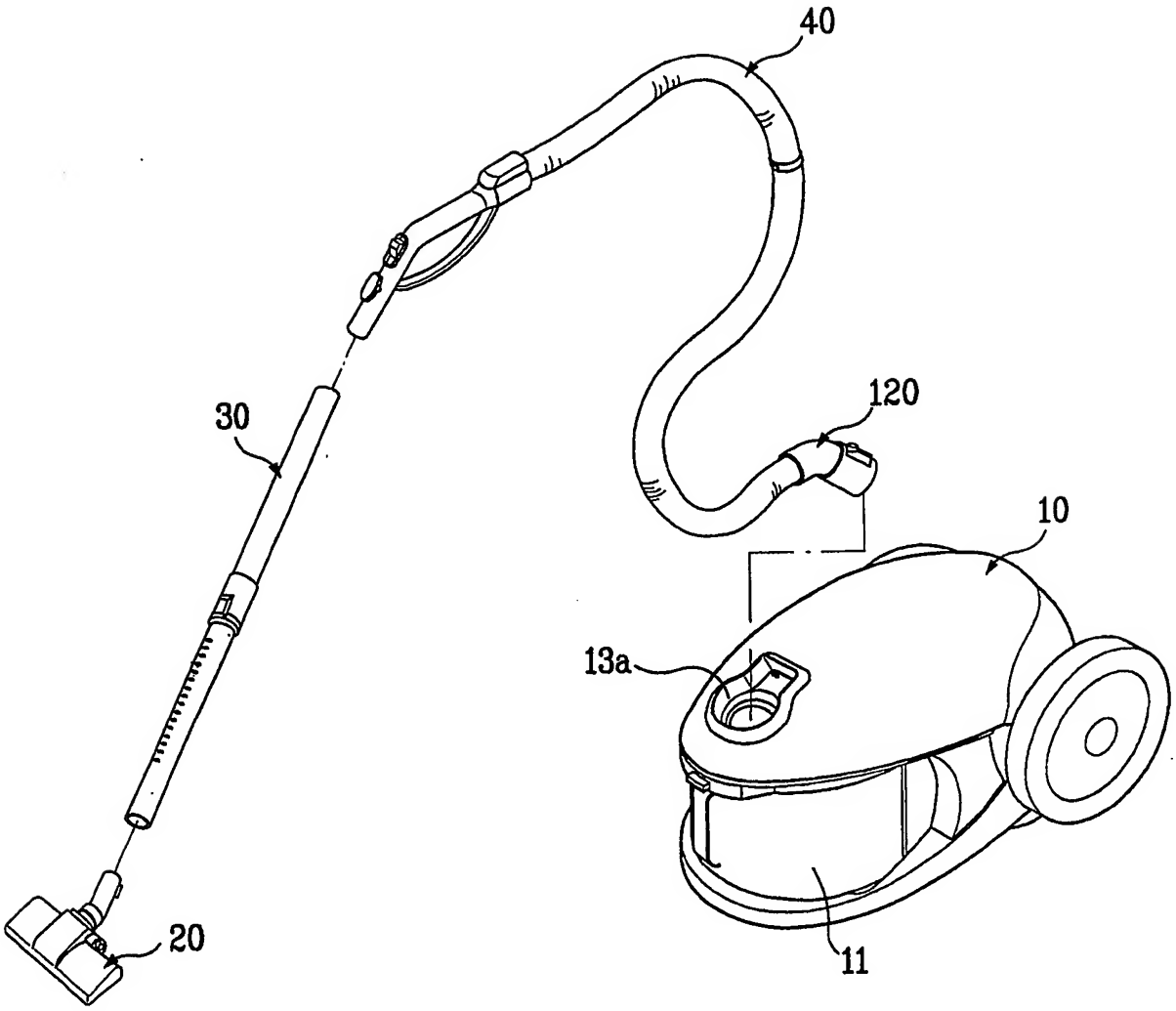

FIG.5

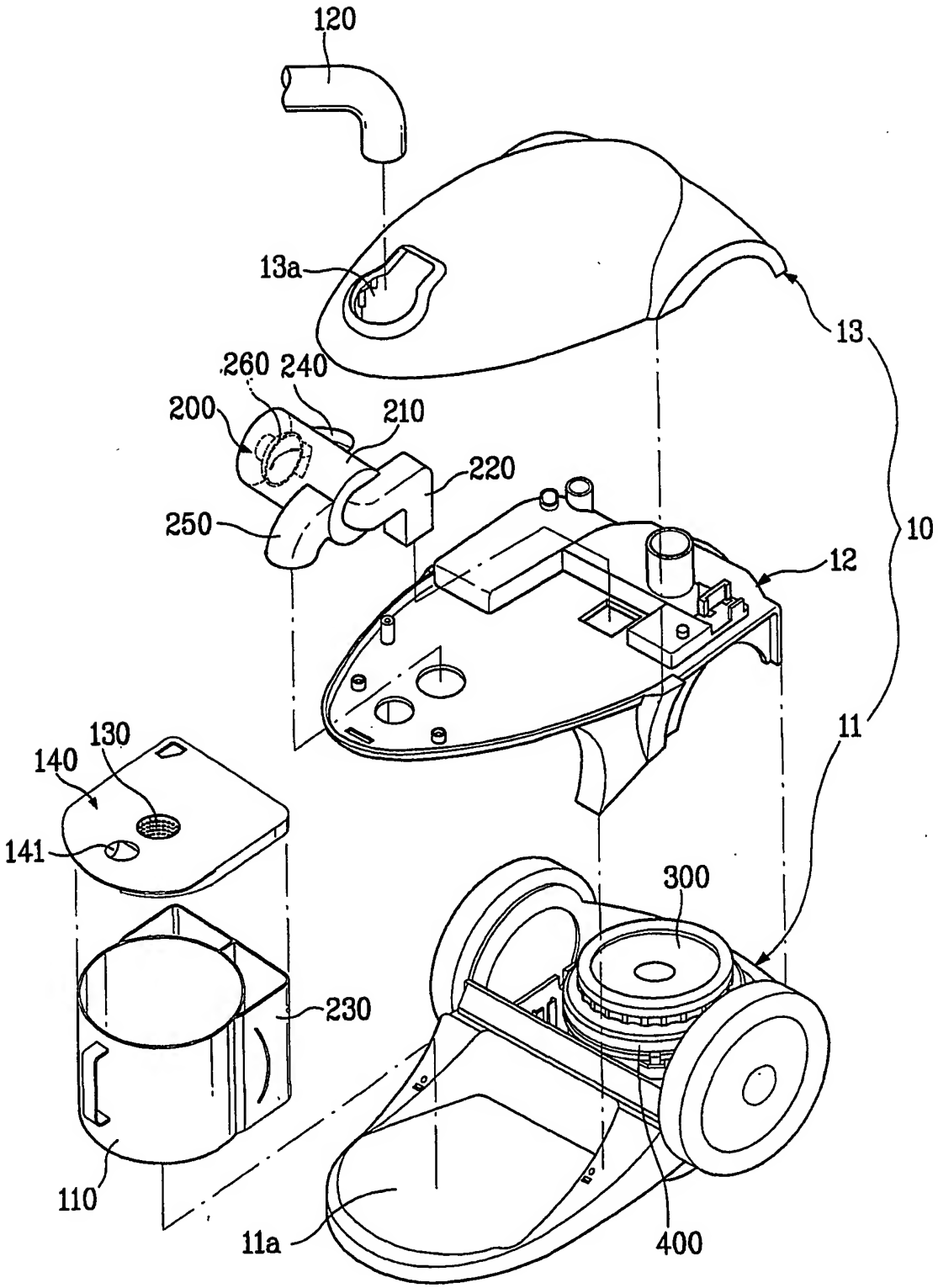
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FIG.6

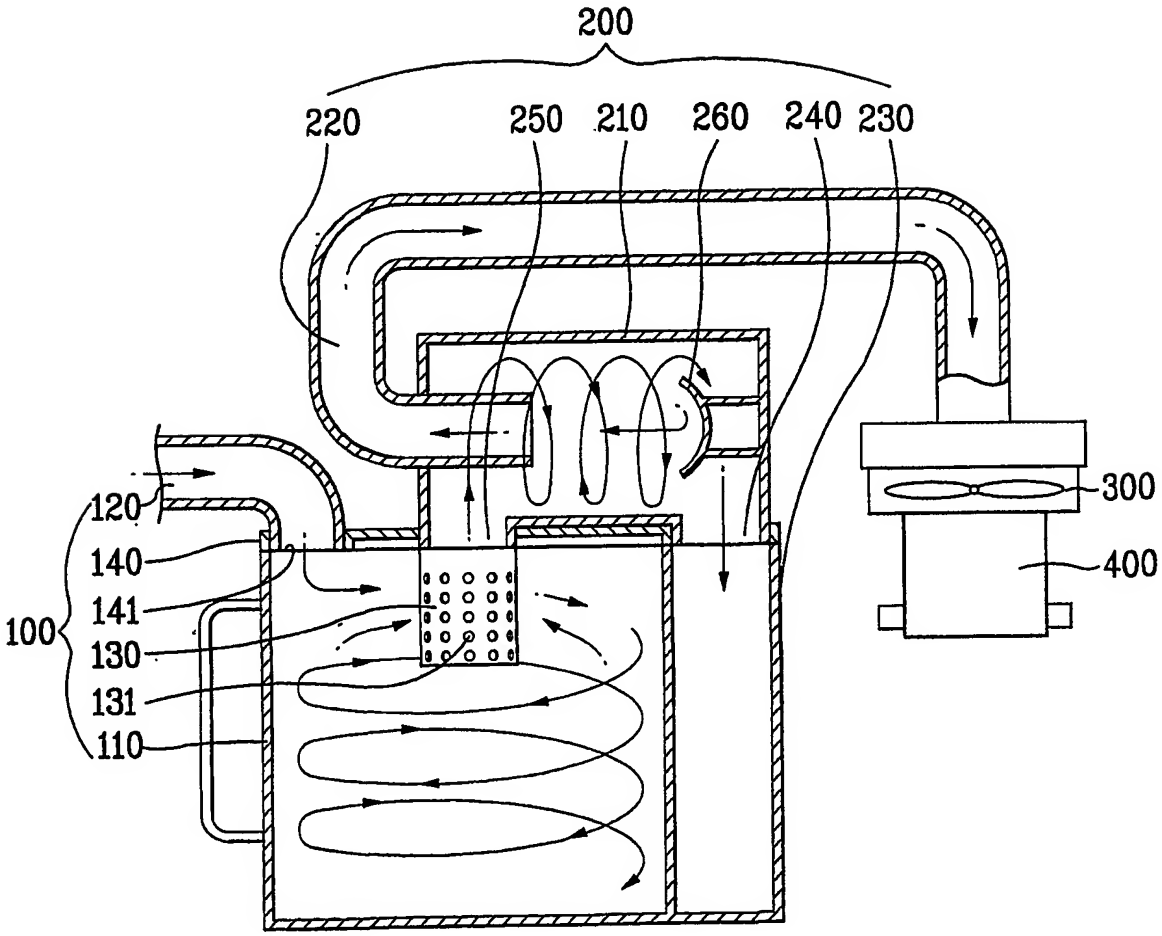

FIG. 7

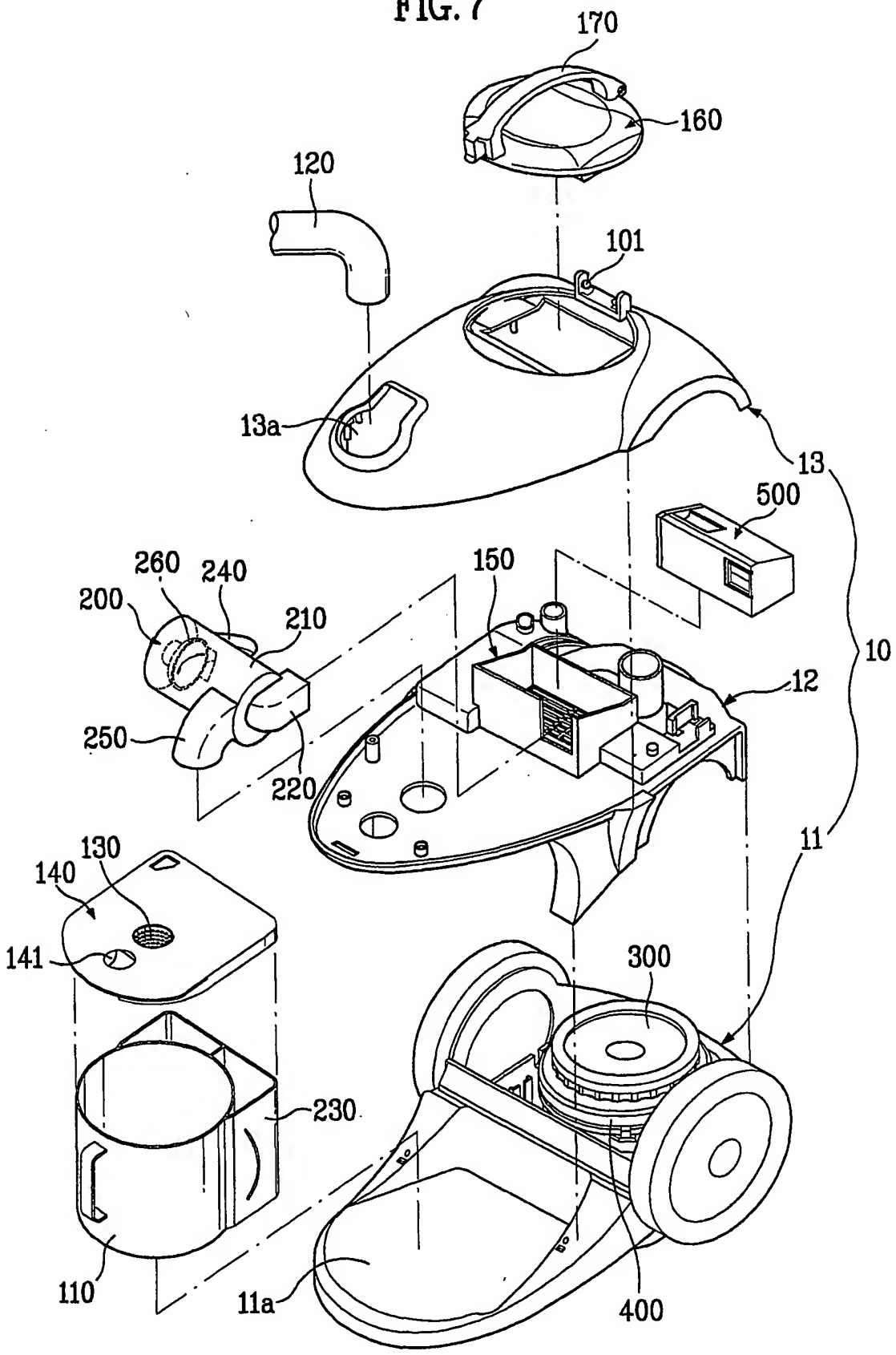
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FIG.8

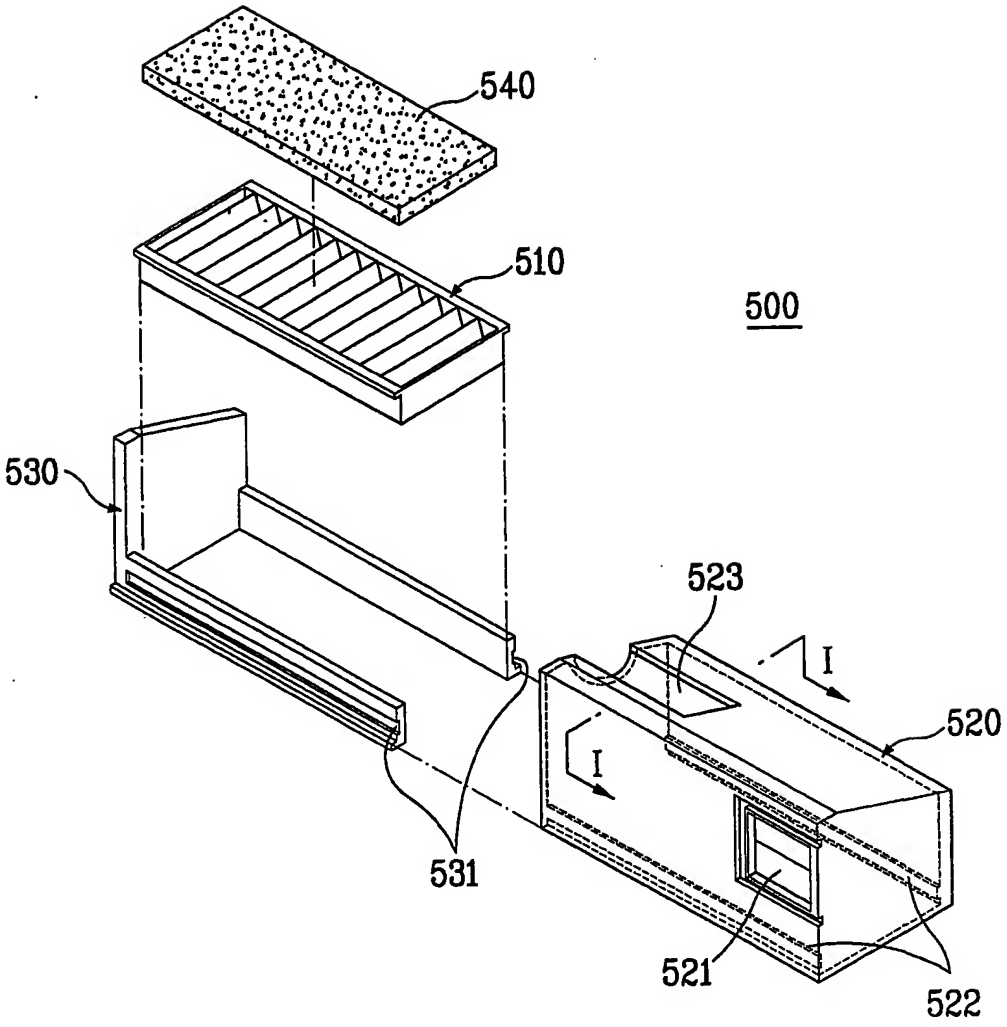

FIG. 9

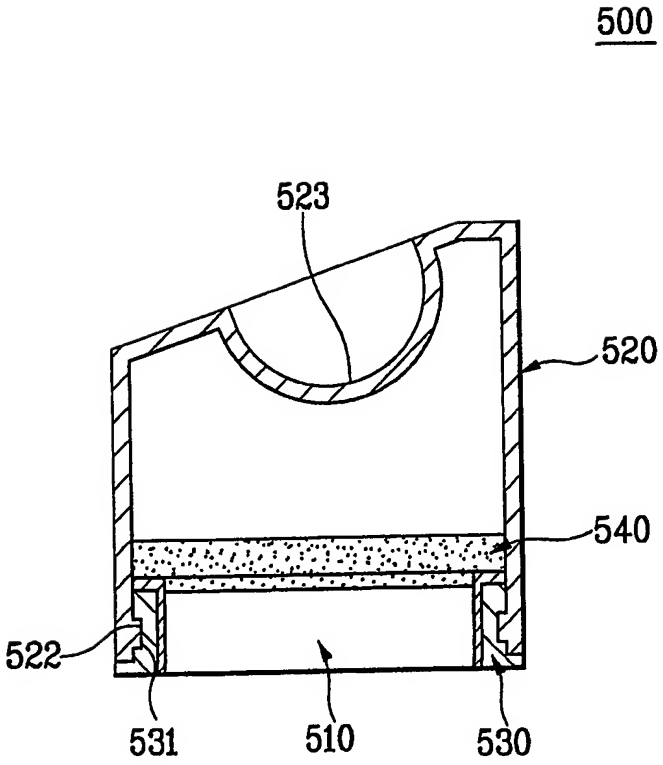

FIG.10

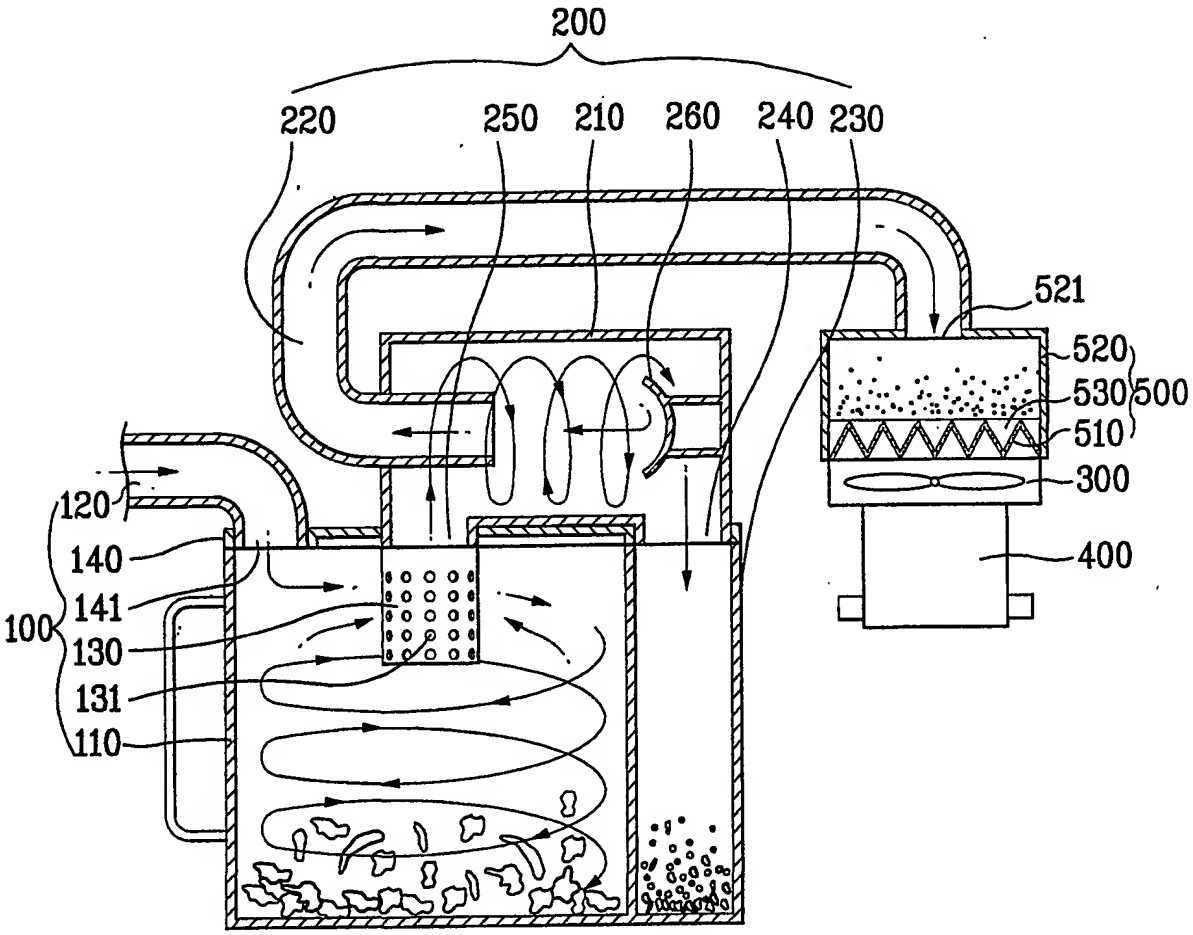
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FIG.11

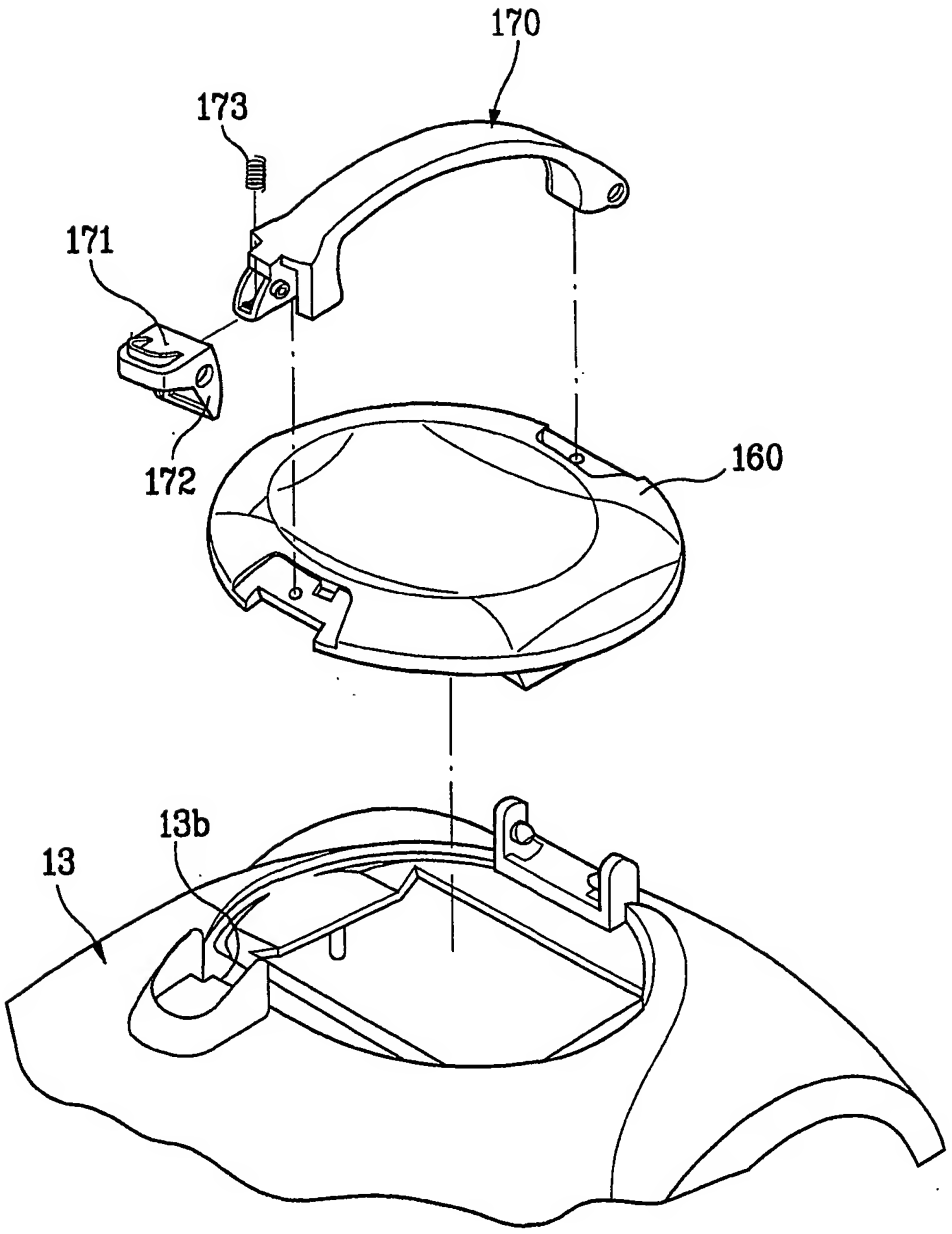


FIG.12A

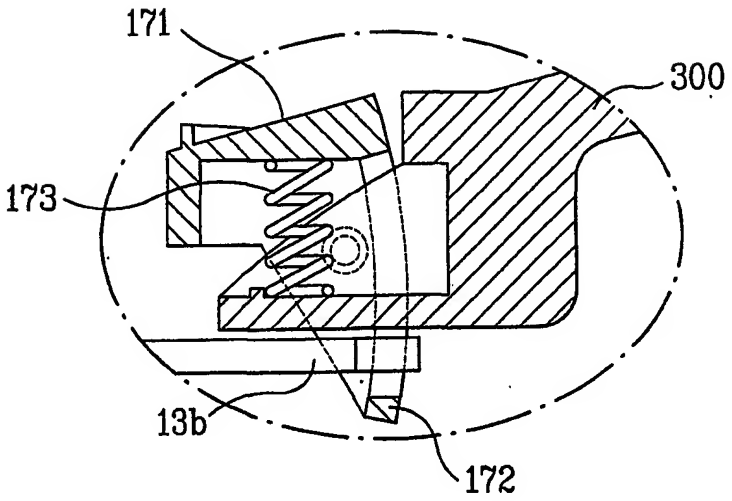


FIG.12B

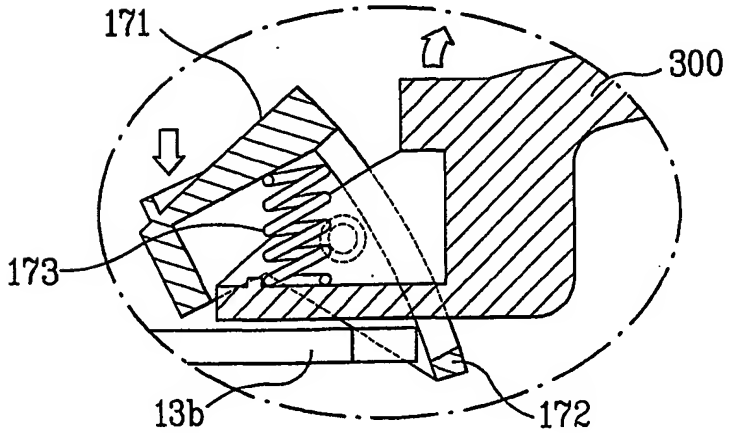


FIG.13

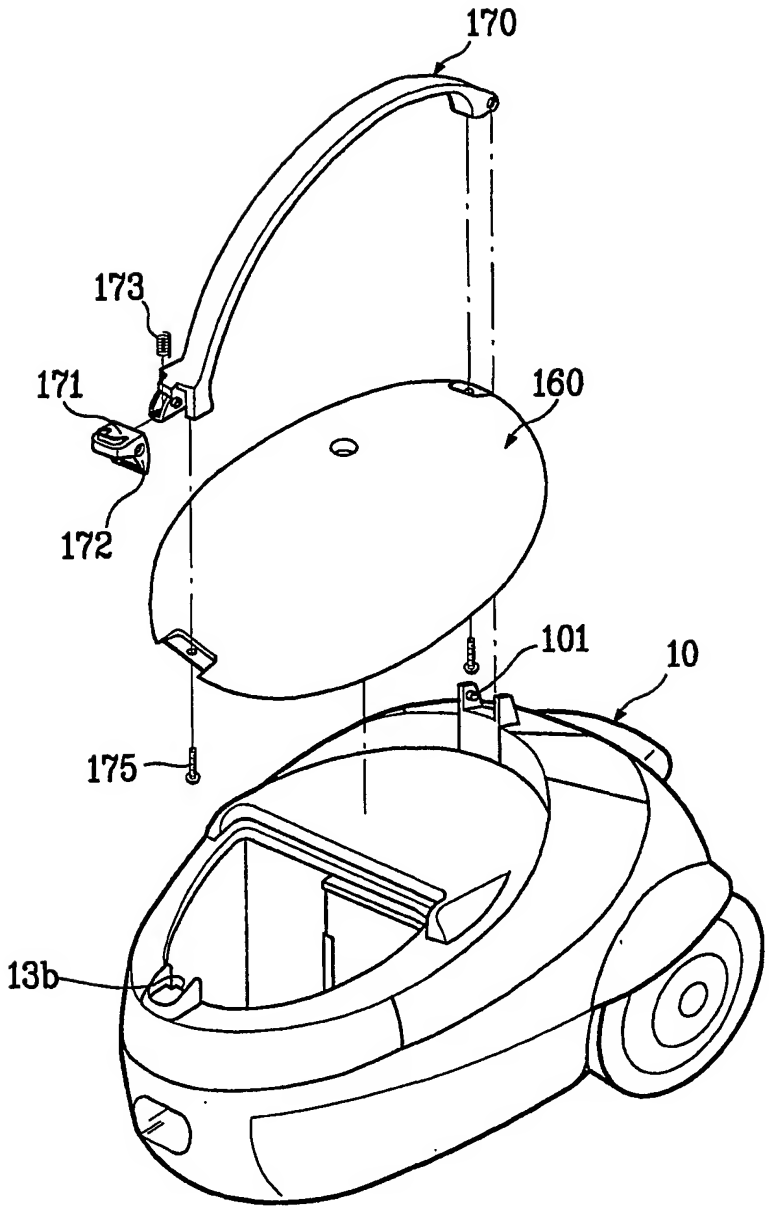


FIG.14

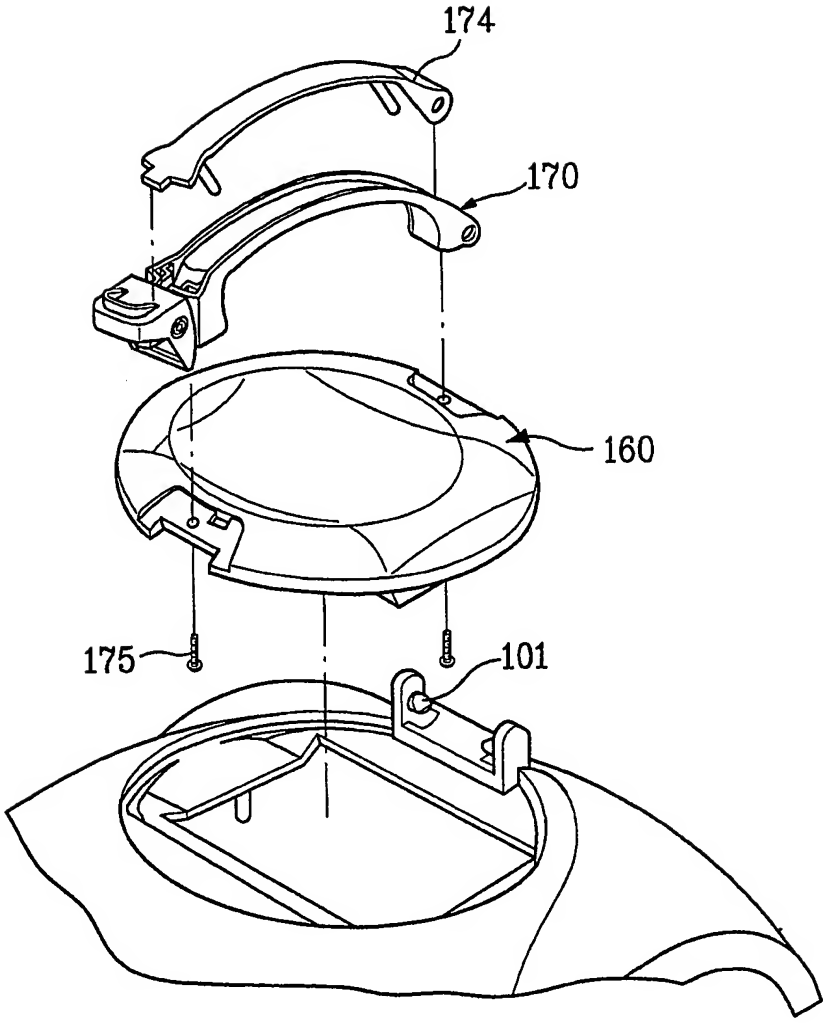


FIG.15

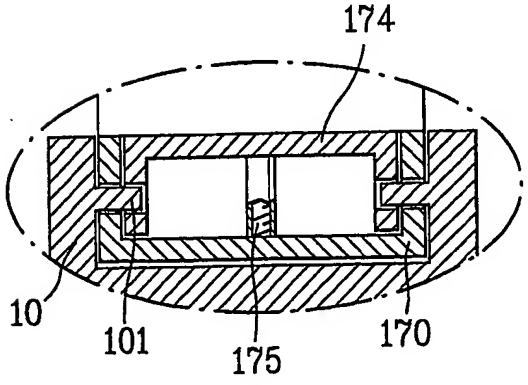
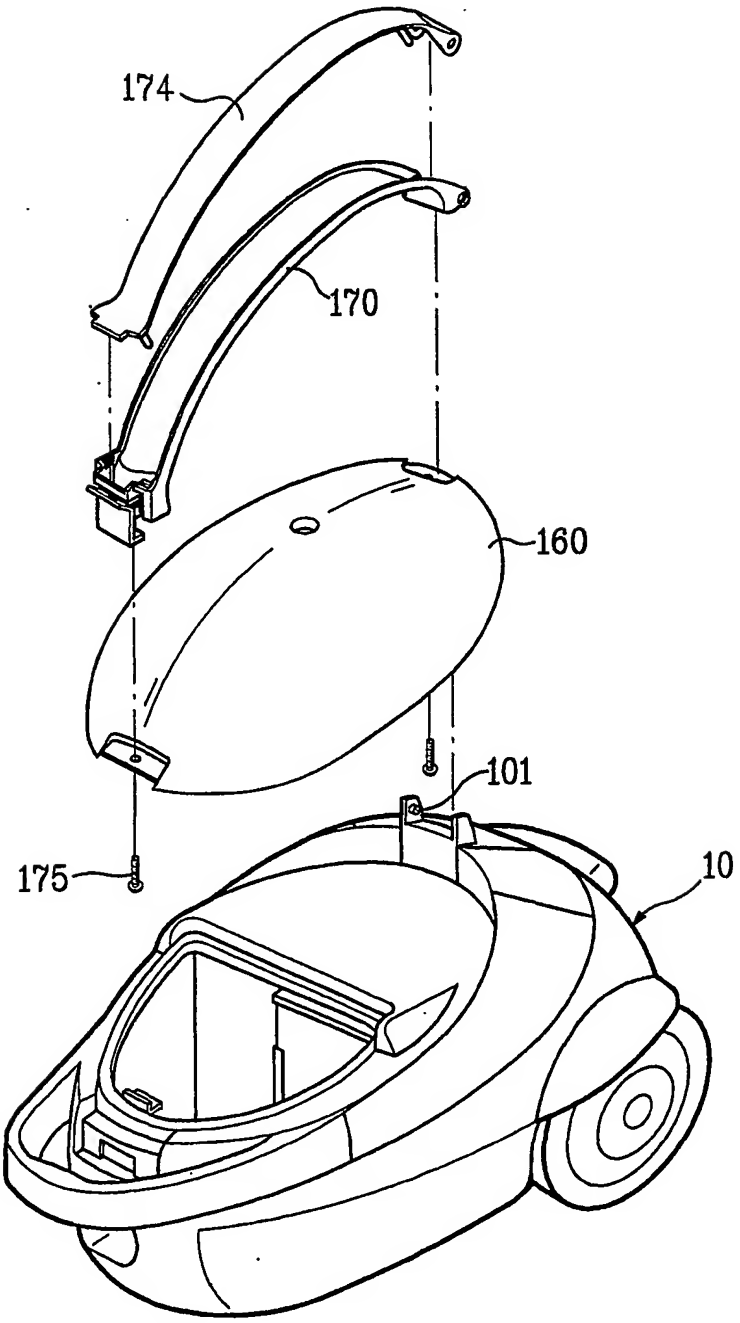


FIG.16



Statement concerning non-prejudicial disclosures or exceptions to lack of novelty

The title of exposition: 2000 COMPORTEC SHOW
The peoriod: 02 February 2000 (02. 02. 2000) - 06 February 2000 (06. 02. 2000)
The site: PARC DES EXPOSITION, PARIS-NORD VILLEPINTE FRANCE
The sponsor: CCIP (CHAMBRE DE COMMERCE ET D'INDUSTRIE DE PARIS

INTERNATIONAL SEARCH REPORT

national application No.
PCT/KR00/00222

A. CLASSIFICATION OF SUBJECT MATTER

IPC7 A47L 9/16, B01D 45/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimun documentation searched (classification system followed by classification symbols)

IPC A47L 9/16, B01D 45/00, B04C

Documentation searched other than minimun documentation to the extent that such documents are included in the fileds searched

KR, IPC as above
JP, IPC as above

Electronic data base consulted during the internationl search (name of data base and, where practicable, search trerms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP, A, 57-145636 (Mitsubishi Electric co., Ltd.) 08 September 1982 (08. 09. 1982) (Family: none) see claim 1; Fig. 1.	1, 8
A	JP, A, 1-230329 (Yokyo Electric co., Ltd.) 13 September 1989 (13. 09. 1989) (Family: none) see Fig. 1, 2, 7.	8 - 11, 14
A	JP, A, 51-11666 (Matsushita Electric Ind. co., Ltd) 29 January 1976 (29. 01. 1976) (Family: none) see Fig. 2.	8, 9
A	JP, A, 58-50918 (Hitachi, Ltd.) 25 March 1983 (25. 03. 1983) (Family: none) see claim 1; Fig. 3.	8, 13

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 NOVEMBER 2000 (14.11.2000)	16 NOVEMBER 2000 (16.11.2000)

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